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ABSTRACT

The number of undergraduate credit hours taken in the sciences, engineering, and engineering technology, and in four major humanities fields (English, history, modern languages, and philosophy) for the fall semester, 1980-1981 was studied, based on a survey of 65 colleges and universities that are members of the American Council on Education's Higher Education Panel. Data from responding institutions were statistically adjusted to represent the national population of 2,732 institutions that enroll undergraduates. Data on undergraduate student credit hours are presented by level of instruction, selected fields of study, and type of institution. Information on lower and upper division student credit hours, along with a comparison of the top 50 universities with all universities, are included. Among the findings are the following: 2-year colleges accounted for 38 percent of the lower division student credit hours in 10 science, engineering, and engineering technology fields; 4-year colleges accounted for 33 percent, and the remaining 29 percent were taken at universities; of these 10 fields surveyed, the basic social sciences reported the largest total of student credit hours, while mathematical sciences and life sciences ranked second and third, respectively; in lower division credit hours, the mathematical sciences ranked first; engineering was the only field studied in which more credit hours were taken in the upper division than in the lower; English and American literature accounted for more than half of the credit hours reported in the four humanities fields; and nearly half of the lower division credit hours in English and American literature were taken in 2-year colleges. Statistical tables, a questionnaire, and technical notes are included. (SW)

ED219000

UNDERGRADUATE STUDENT CREDIT HOURS IN SCIENCE, ENGINEERING, AND THE HUMANITIES FALL 1980

Frank J. Atelsek and Charles J. Andersen

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AMERICAN COUNCIL ON EDUCATION

JUNE
1982

A Survey Funded by the National Science Foundation, the U. S. Department of Education, and the National Endowment for the Humanities

AMERICAN COUNCIL ON EDUCATION

J. W. Peltason, *President*

The American Council on Education, founded in 1918, is a council of educational organizations and institutions. Its purpose is to advance education and educational methods through comprehensive voluntary and cooperative action on the part of American educational associations, organizations, and institutions.

The Higher Education Panel is a survey research program established by the Council for the purpose of securing policy-related information quickly from representative samples of colleges and universities. *Higher Education Panel Reports* are designed to expedite communication of the Panel's survey findings to policy-makers in government, in the associations, and in educational institutions across the nation.

The Higher Education Panel's surveys on behalf of the Federal Government are conducted under contract support provided jointly by the National Science Foundation, the National Endowment for the Humanities, and the U. S. Department of Education (NSF Contract SRS-78-16385).

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Undergraduate Student Credit Hours in Science, Engineering, and the Humanities, Fall 1980

Frank J. Atelsek

Charles J. Andersen

Higher Education Panel Reports

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As is the case for the other studies in this series, we owe our primary debt and gratitude to our campus representatives who helped coordinate the survey and to the college and university staff members who provided the information for it.

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HIGHLIGHTS

- Nearly 49 million undergraduate student credit hours were taken in science, engineering, and engineering technology fields at the nation's colleges and universities in the first half of academic year 1980-81. Another 21 million were taken in four major fields of the humanities (English and American literature, history, modern languages, and philosophy).
- Seventy-six percent of the credit hours in the science, engineering, and engineering technology fields were taken at public institutions and the remaining 24 percent at private colleges and universities. In the four humanities fields, 73 percent were taken in the public sector and 27 percent in the private.
- More than three quarters (78 percent) of the credit hours in the science, engineering, and engineering technology fields were in lower division courses. For the four humanities fields, however, lower division courses accounted for nearly nine out of ten (87 percent) of the credit hours taken.

SCIENCE, ENGINEERING, AND ENGINEERING TECHNOLOGY

- Two-year colleges accounted for 38 percent of the lower division student credit hours in the ten science, engineering, and engineering technology fields; four-year colleges accounted for 33 percent, and the remaining 29 percent were taken at universities. Fifty-four percent of the upper division credits in these fields were taken at universities and 46 percent at four-year colleges.
- Of the ten science, engineering, and engineering technology fields surveyed, the basic social sciences reported the largest total of student credit hours (11.2 million). Mathematical sciences, with 9.8 million, and life sciences,

with 6.7 million, ranked second and third, respectively. Together, the three fields accounted for over half (57 percent) of the student credit hours reported in the ten fields.

- In lower division credit hours, the mathematical sciences ranked first with nearly 9 million. The basic social sciences (8.4 million) and life sciences (5.1 million) stood second and third, respectively.
- Engineering was the only field studied in which more credit hours were taken in the upper division (2.1 million) than in the lower (1.2 million).

HUMANITIES

- Two-year colleges accounted for 40 percent of the lower division student credit hours in the four humanities fields, four-year colleges accounted for 35 percent, and universities, 25 percent. Upper division credit hours were divided between universities and four-year colleges--42 percent taken at the universities and the remaining 58 percent at the four-year colleges. This is in sharp contrast to the distribution of upper division credit hours for science, engineering, and engineering technology with 54 percent taken at universities and only 46 percent at four-year colleges.
- English and American literature accounted for more than half (54 percent) of the credit hours reported in the four humanities fields surveyed.
- Of the 10.2 million lower division credit hours in English and American literature taken in the first half of last year, nearly half (48 percent) were taken in two-year colleges.

Overview

In sponsoring this survey, the National Science Foundation (NSF) and the National Endowment for the Humanities (NEH) sought to develop base line information about the amount and level of science, engineering, engineering technology, and humanities instruction being provided at various types of institutions. In particular, the sponsors were interested in obtaining information on the relative share of the instructional burden borne by two-year institutions. No alternative source existed for two-year colleges that was comparable, for example, to the bachelor's degree awards that permit instructional "burden" comparisons between four-year colleges and universities. Once a base line of these data is established, the Foundation, the Endowment, and other agencies will be able to track the changes in student course consumption among the fields within their purview. Prior to this survey, such tracking of students' academic activity has been confined to broad indicators that are less focused than credit hour information. Data about students' major fields or the disciplines in which baccalaureate degrees are awarded, for example, represent only broad aggregations of credit hours over many college terms. Obviously these proxies fail to provide information on student involvement in fields in which "minors" are declared, in "service courses," or in other required nonmajor courses within a degree program. Only a survey of credit hours taken during a specific term can reflect the full range of students' experience with academic course offerings.

This survey, then, provides a "snapshot" of the credit hour situation in the first half of academic year 1980-81, and it lays the foundation for future comparisons. It will be particularly helpful in the sciences, engineering, and engineering technology where its coverage of fields is quite complete. The

four humanities fields examined are major disciplines and account for over half of the humanities baccalaureates produced in recent years. Furthermore, these fields were selected to match those for which faculty data were gathered in an earlier HEP survey[1] sponsored by NEH. Thus, it should be possible to compare these two data sets subsequently.

The term "student credit hours" was, for the purposes of this survey, defined as "credit value of a course multiplied by the number of students registered for that course." Inasmuch as most institutions make their course registrations a matter of record after the twelfth class meeting, indications are that the data shown in this report represent the number of course credits taken, not the number offered or the number successfully completed.

The study obtained data for not only total credit hour estimates, but for lower and upper division credit hours separately. As will be seen later in this report, the distributions by level vary considerably from field to field and between types of institution. It should be noted here that the two-year colleges were directed to report all of their credit hours in the lower division. Although there is a movement at numerous two-year institutions to develop courses that are comparable to upper division work, estimating the prevalence of such activity was outside the scope of this survey.

Readers may be surprised by the large number of lower division credit hours taken in some of the fields surveyed (e.g., ninety percent of the credit hours in English and American literature). This, of course, is due to the vast numbers of students taking basic courses required in a wide variety of curricula.

1. HEP Survey No. 51. Selected Characteristics of Full-time Humanities Faculty, Fall 1979 (Washington: American Council Education, 1981).

Listed below are the fields of study included in this survey. For identification of subfields within each of the fields, see the second page of appendix A.

Science, engineering, and engineering technology

Chemistry
Computer science
Earth sciences
Engineering
Engineering technology
Life sciences
Mathematical sciences
Physics/astronomy
Psychology
Social sciences (basic)

Humanities

English and American literature
History
Modern languages
Philosophy

Methods Summary

The Higher Education Panel is a continuing survey research program created in 1971 by the American Council on Education to conduct specialized surveys on topics of current policy interest both to the higher education community and to government agencies.

The Panel is a stratified sample of 760 colleges and universities drawn from the population of more than 3,000 institutions listed in the National Center for Education Statistics' (NCES) Education Directory, Colleges and Universities. All institutions in the population are grouped according to the Panel's stratification design, which is based on three factors: institution type (whether a school is a university, four-year college, or two-year college), control or governance (whether it is public or private), and size (as measured by full-time-equivalent enrollment). For any given survey, either the entire Panel or an appropriate subgroup is used.

The survey instrument was mailed in June of 1981 to all Panel institutions that enroll undergraduate students. After mail and telephone

follow-ups were completed, responses were received from 563, or 81 percent, of the 698 institutions surveyed.

Among the 563 respondents, 65 reported that their institutions made no distinction between upper and lower division courses. In processing the survey, these 65 were treated as nonrespondents.

The differences between academic calendars (quarters, trimesters, semesters, etc.) were resolved by converting all credit hours to a semester credit basis. For institutions on the quarter plan, this meant extending the quarter credit data tc one-half an academic year by multiplying them by one and one-half (half an academic year of three quarters). The resulting half-year's credit was then multiplied by two-thirds, which is the ratio between the normal credit requirements for a baccalaureate at a semester system institution and one at a quarter plan college. Because these two operations cancel each other, the figures provided by the quarter plan institutions fairly represent one-half year's effort at such institutions expressed in semester credits. Institutions with other than semester or quarter system calendars were dealt with individually to convert all credit hour information to a semester basis.

Data from responding institutions were statistically adjusted to represent the national population of 2,732 institutions that enroll undergraduates. Institutional weights were created for each stratification cell by computing the ratio of the number of institutions in the population to the number of institutions that responded.

Appendix B contains more detailed technical notes about: 1) the stratification and weighting design used to produce the national estimates in this report; 2) a comparison of selected institutional characteristics among respondents and nonrespondents; and 3) a tabular presentation and discussion of the confidence intervals for the credit hour estimates derived from the survey.

Findings

Two- and four-year colleges and universities "produced" the equivalent of nearly 70 million semester hours in the sciences, engineering, and engineering technology, and in four major humanities fields during the first half of the 1980-81 academic year. Analysis of the data by level of instruction shows that four-fifths (81 percent) of the credits were taken in lower division courses (table A). This proportion seems consistent with enrollment data from the National Center for Education Statistics (NCES) that reported that 71 percent

Table A

Credit Hours of Course Work Taken in Ten Science, Engineering, and Engineering Technology Fields and Four Humanities Fields, by Level of Instruction

Level of Instruction	Credit Hours	Percent
Total	69,931,000	100
Lower division	56,481,000	81
Upper division	13,450,000	19

of the undergraduate enrollees (full-time-equivalent enrollments) were in their first two years of college.[2]

The difference (71 percent vs. 81 percent) may be partly due to the selective nature of the fields of study included in this survey. Such fields as English and American literature, mathematical sciences, and modern languages, for example, include many "service" courses that students must take to meet institutional requirements for graduation. Students tend to take these required courses in their first two years of study.

2. National Center for Education Statistics, Fall Enrollment in Higher Education, 1978 (Washington: Government Printing Office, 1979), table 5.

In using these survey data, readers should remember that the figures do not represent all of the undergraduate course work offered at the nation's colleges and universities. Excluded from the survey were such areas of college offerings as education, business and commerce, and other nonscience fields, including specialty fields within the humanities.[3]

Type of Institution

Each of the three major components of the nation's postsecondary education system generated about one-third of the credits reported in the survey (table B). The four-year colleges, many of which are liberal arts institutions, accounted for the largest proportion of science, engineering,

Table B

Credit Hours of Course Work Taken in Ten Science, Engineering, and Engineering Technology Fields and Four Humanities Fields by Type of Institution

Type of Institution	Science, Engineering, and Engineering Technology		Humanities	
	Number (000's)	Percent	Number (000's)	Percent
All institutions	48,967	100	20,965	100
Universities	16,970	35	5,725	27
Four-year colleges	17,498	36	7,886	38
Two-year colleges	14,500	30	7,354	35

Note: In this and the following tables, detail may not sum to totals because of rounding.

engineering technology, and humanities credits (36 percent and 38 percent, respectively). It should be remembered that the fields included were predominately those that comprise the "arts and sciences" fields that have

3. A full listing of the specific fields included in this study is found in appendix A, Survey Instrument.

traditionally been the areas of concentration for the liberal arts institutions.

The universities accounted for just over one-third (35 percent) of the science, engineering, and engineering technology credits, but only 27 percent of the humanities credits. In contrast, two-year colleges reported a slightly smaller proportion (30 percent) of the credits in the former fields and 35 percent of the credit hours in the humanities.

When only the lower division credits were examined, the two-year colleges came to the forefront. Almost two-fifths (39 percent) of all such credits were taken at this type of institution. The proportion holds true generally for both major academic areas: 38 percent for science, engineering, and engineering technology lower division credit hours and 40 percent for humanities credits.

Control of Institution

Distribution of the credits by control of institution is shown in table C. About one-quarter are taken in the private sector and three-quarters in the public. This compares with enrollment figures from NCES showing a 24/76

Table C

Credit Hours of Course Work Taken in Ten Science, Engineering, and Engineering Technology Fields and Four Humanities Fields, by Control of Institution

Control	Science, Engineering, and Engineering Technology		Humanities	
	Number (000's)	Percent	Number (000's)	Percent
All institutions	48,967	100	20,965	100
Public	37,431	76	15,292	73
Private	11,535	24	5,673	27

percent division between private and public institutions for full-time-equivalent undergraduate enrollments.

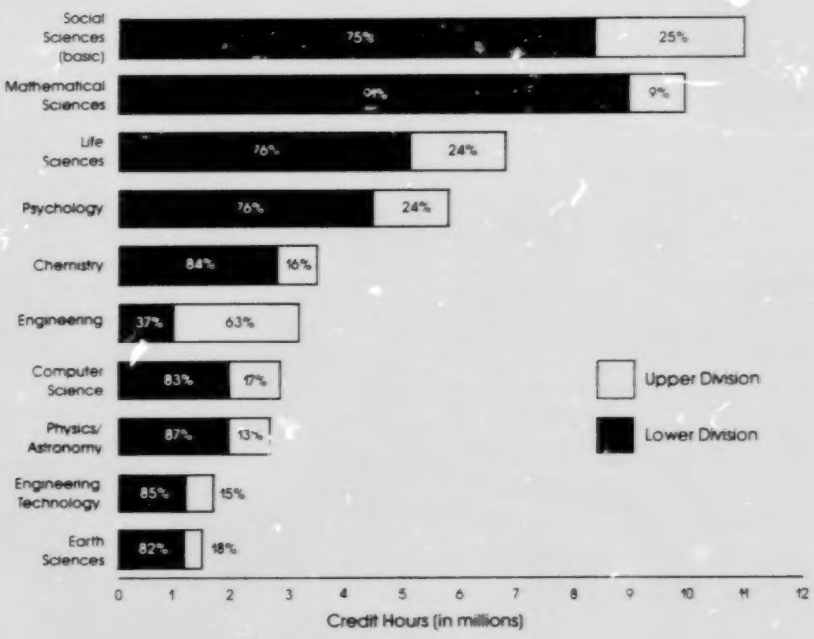
Fields of Study

The ten science, engineering, and engineering technology fields accounted for almost 49 million (70 percent) of the student credit hours covered by the survey. The preponderant majority (78 percent) of the credits taken were in lower division courses. As shown in figure 1, however, the split between lower and upper division credits varies widely among the fields. In the mathematical sciences, for example, fewer than 10 percent of the credit hours taken were in upper division courses, while more than three-fifths (63 percent) of the credit hours taken in engineering were in upper division courses. This, of course, is a result of the many "service" courses that are offered in the former field

Figure 1

Undergraduate Student Credit Hours in Ten Science, Engineering, and Engineering Technology Fields by Level of Instruction and Field of Study

Fall 1980



which are typically defined as lower division courses and taken in an early college year. Engineering, on the other hand, offers few, if any, service courses.

The basic social sciences, the life sciences, and the field of psychology also have an above-average share of credits taken in upper division courses (25 percent, 24 percent, and 24 percent respectively). While these fields have large components of service courses, it is also true that many students major in them and, therefore, one would expect an above-average array of upper division courses.

The 49 million credit hours taken in science, engineering, and engineering technology fields during the fall term of 1980 were distributed among the ten fields as follows:

	Percentage of Credit Hours
Basic social sciences	23
Math sciences	20
Life sciences	14
Psychology	12
Chemistry	7
Engineering	7
Computer science	5
Physics/astronomy	5
Engineering technology	3
Earth sciences	3
Total	100

Of the four humanities fields covered by the survey, English and American literature accounted for more than half of the student credit hours while philosophy represented only 9 percent:

	Percentage of Credit Hours
English and American literature	53
History	22
Modern languages	16
Philosophy	9
Total	100

Figure 2 shows how the humanities credit hours were distributed between lower and upper division courses. Of the more than 11 million credit hours in English and American literature, only 10 percent were taken in upper division courses. For history and philosophy, the proportion of upper division credit hours is considerably higher (18 percent), and for modern languages, the upper division percentage is in the mid-range (14 percent).

Differences Among Types of Institutions

When the survey data are analyzed by type of institution, even greater differences in credit hour distributions are evident, as shown in figures 3 through 6.

Sciences, Engineering, and Engineering Technology. The four-year colleges produced more basic social science credit hours than either the universities or the two-year colleges (see figure 3). This lead prevailed in three other fields--life sciences, psychology, and earth sciences. In all of the other fields, either the universities or two-year colleges produced more credit hours.

In both the university and four-year college sectors, the mathematical sciences were second to the basic social sciences. Again, the four-year

Figure 2

Undergraduate Student Credit Hours in
Four Humanities Fields
by Level of Instruction and Field of Study

Fall 1980

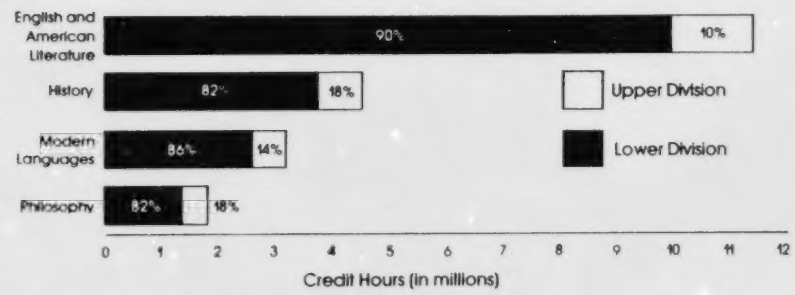
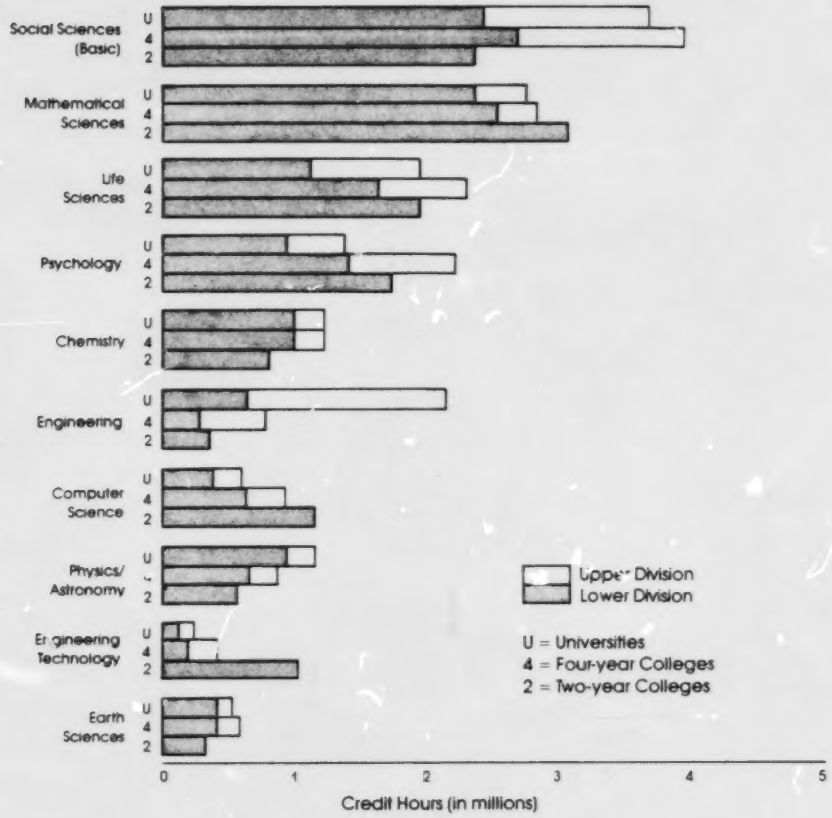


Figure 3

Undergraduate Student Credit Hours in
Ten Science, Engineering, and Engineering Technology Fields
by Level of Instruction, Field of Study and Type of Institution

Fall 1980



colleges outproduced the universities in terms of total credits. In all likelihood, this lead is a result of the proportionately larger undergraduate enrollments in the four-year colleges and the "service" nature of the field. Even more notable is that in the mathematical sciences, the two-year institutions outstripped both of the other sectors with about 3.5 million student credit hours taken. This may partly reflect the remedial emphasis adopted by many two-year colleges in recent years.

Two other results that stand out are the distributions of credit hours in engineering and engineering technology. Although the former ranks sixth among

the science, engineering, and engineering technology fields overall, in the university sector it ranks third, just below mathematical sciences. As mentioned in the previous section, the field is notable for its heavy concentration of upper division courses.

In the case of engineering technology, the ranking is ninth out of the 10 science, engineering, and engineering technology fields overall. But its position moves up to sixth in the two-year college sector, just below computer science. By far, the most student credit hours taken in this field (68 percent) are taken at two-year colleges.

Table D shows upper division student credit hours in each field as a percentage of all credit hours in the university and four-year college sectors separately. These percentages are remarkably close in most fields. Only in engineering, life sciences, and computer science do the percentages vary by ten or more percentage points.

Distribution of upper division credit hours between institutional types

Table D

Upper Division Student Credit Hours in Ten Science, Engineering, and Engineering Technology Fields as a Percentage of All Student Credit Hours in Each Field, by Type of Institution

Field	Percentages for	
	Universities	Four-year Colleges
Engineering	72	62
Engineering technology	48	48
Life sciences	43	29
Computer science	38	26
Social sciences (basic)	34	32
Psychology	32	38
Earth sciences	27	21
Chemistry	20	21
Mathematical sciences	14	13
Physics/astronomy	13	20

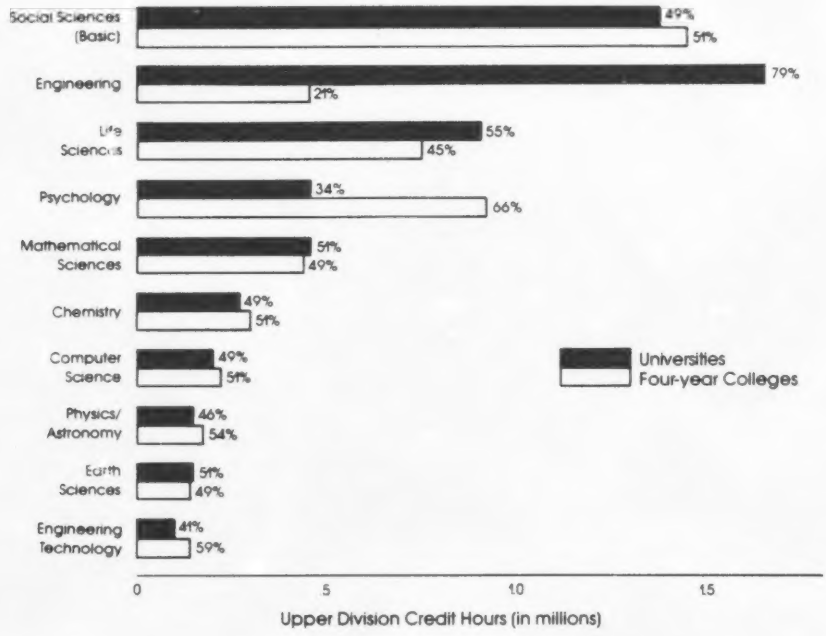
is shown in figure 4. In only two fields did the university sector produce a clear preponderance of such credit hours; in engineering, the universities accounted for nearly four-fifths (79 percent), and in life sciences they produced 55 percent. In five fields (social sciences, mathematical sciences, chemistry, computer science, and earth sciences), the split between universities and four-year colleges was almost even--between 49 and 51 percent for one sector or the other. In the remaining three fields (psychology, physics/astronomy, and engineering technology) the four-year college sector produced the clear majority of the upper division credit hours.

Humanities. Figure 5 shows the distribution of student credit hours in the four humanities fields surveyed, by level of instruction, type of

Figure 4

Upper Division Student Credit Hours in
Ten Science, Engineering, And Engineering Technology Fields
by Type of Institution

Fall 1980



Note: Fields of study are in rank order by total upper division credits taken.

institution, and field. It illustrates the heavy concentration of credit hours taken in English and American literature in each of the institutional sectors. It also shows that the largest number of credits in this field were taken in the two-year colleges. In history and philosophy, the four-year college sector shows the largest concentration of credit hours, whereas in modern languages, the universities show the heaviest concentration.

Figure 5

Undergraduate Student Credit Hours in
Four Humanities Fields
by Level of Instruction, Field of Study and Type of Institution

Fall 1980

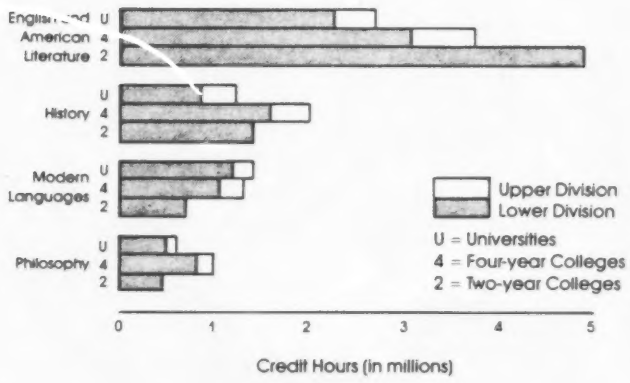


Table E shows the upper division credit hours as a percentage of the total taken in the university and four-year college sectors separately. As in the ten science, engineering, and engineering technology fields, the upper division proportions in each of the four humanities fields surveyed are very similar in the two types of institution. History was the field with the largest difference, with just under one-third (31 percent) of the credit hours taken in upper division courses at the universities. The corresponding figure for the four-year institutions was less than one-quarter (22 percent).

When upper division credit hours in the humanities are distributed between the universities and the four-year colleges, the latter turn out to be the

Table E

Upper Division Student Credit Hours in Four Humanities Fields as a Percentage of All Student Credit Hours in Each Field by Type of Institution

Field	Percentages for	
	Universities	Four-year Colleges
History	31	22
Philosophy	21	24
Modern languages	16	20
English & American literature	16	18

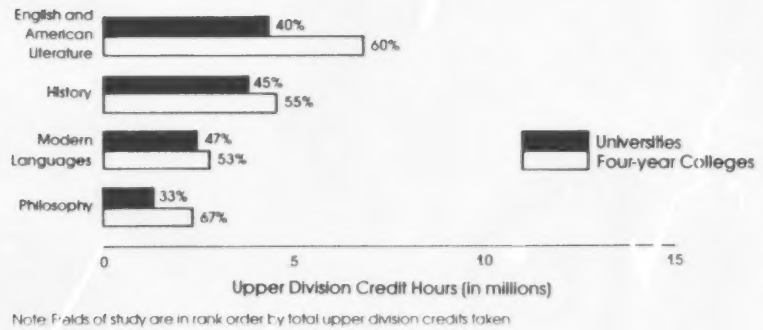
heavy producers in each of the four fields surveyed (see figure 6). This strength appears to reinforce the comments made earlier about the four-year colleges' concentration in the traditional liberal arts fields. It also differs from the pattern in the science, engineering, and engineering technology fields where, in only three out of ten disciplines, did the four-year college sector clearly outproduce the universities.

Top 50 Universities. The 50 universities that awarded the largest number of bachelor's degrees in 1977-78 accounted for 23 percent of all baccalaureates

Figure 6

Upper Division Student Credit Hours in Four Humanities Fields by Type of Institution

Fall 1980



Note: Fields of study are in rank order by total upper division credits taken

that year. These same top 50 institutions accounted for slightly more than that percentage (26 percent) of upper division student credit hours taken in the fall of 1980 in the fourteen fields surveyed.

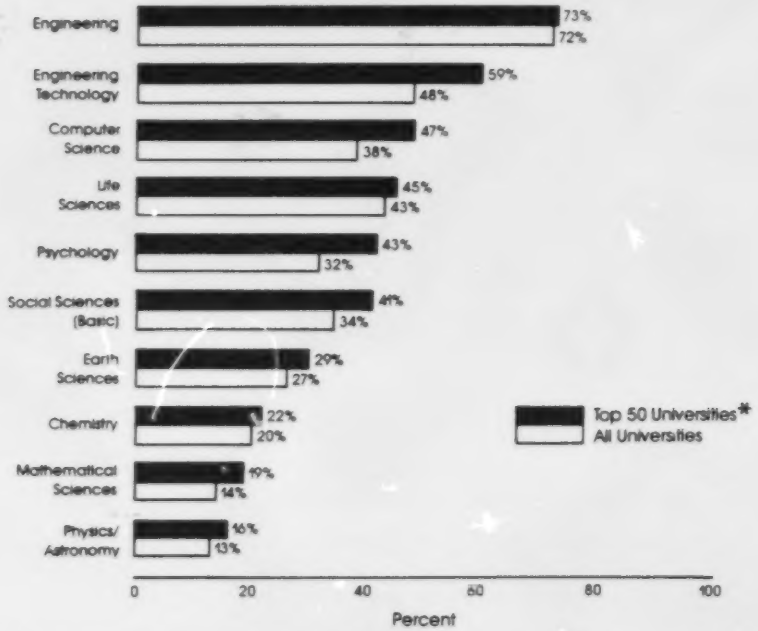
Figure 7 shows how the top 50 universities compare to all universities in proportions of upper division credits taken in the ten science, engineering, and engineering technology fields. The top 50 show greater proportions of upper division credits taken in all ten fields. This disparity is especially great in the following three fields.

	Percentage for	
	Top 50 Universities	All Universities
Engineering technology	59	48
Computer science	47	38
Psychology	43	32

Figure 7

Upper Division Credit Hours
as a Percent of All Undergraduate Credit Hours in
Ten Science, Engineering, and Engineering Technology Fields
by Field of Study
Fall 1980

Top 50 Institutions* Compared with All Universities



*The 50 universities that awarded the largest number of bachelor's degrees in 1977-1978.

Engineering technology is a field usually associated with the two-year college. Indeed, 80 percent of the lower division credit hours in engineering technology are taken at public two-year colleges. The distribution of upper division credit hours, however, is another matter. Among universities, for example, their concentration is heavier in the top 50 universities (59 percent) than in the university sector as a whole. Survey data provide no definitive explanation for this; however, two factors should be pointed out. First, tne number of upper division credit hours generated in this field is quite small--only a quarter of a million, or 2.3 percent of all such credits in the sciences, engineering, and engineering technology. Second, the field is growing rapidly. Eleven years ago only 5,100 bachelor's deg ees were awarded in engineering technology, but in 1979-80, the total had grown to over 10,000; and thirty-six states had at least one institution that offered a bachelor's degree program in the field.[4]

The same pattern of differences is apparent among the four humanities fields surveyed (see figure 8). The proportion of credit hours taken in upper division courses, however, is notably smaller (a 27 percent average among the four humanities fields vs. a 39 percent average for science, engineering, and engineering technology credit hours). At the top 50 universities, history had the greatest proportion of credit hours taken in upper division courses (36 percent). English and American literature also had a relatively strong representation in upper division credit hours (26 percent at the top 50 universities compared to only 16 percent at universities taken as a whole).

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4. National Center for Education Statistics, Earned Degrees Conferred series (Washington, D.C.: Government Printing Office), 1970-71, p. 292; unpublished data for 1979-80.

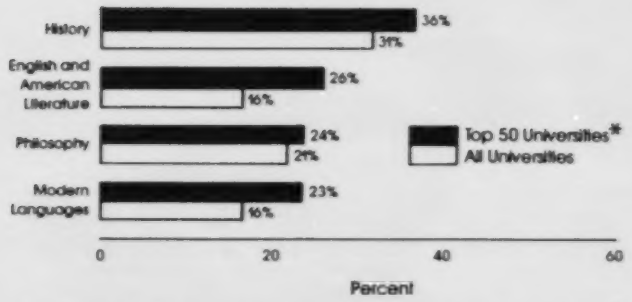
College Board, The College Handbook Index of Majors, (New York: College Board, 1977), p. 255.

Figure 8

Upper Division Credit Hours
as a Percent of All Undergraduate Credit Hours in
Four Humanities Fields
by Field of Study

Fall 1980

Top 50 Institutions* Compared with All Universities



* The 50 universities that awarded the largest number of bachelor's degrees in 1977-1978.

A Concluding Note

This survey is a first-time effort and as such only provides the initial base line data about undergraduate credit hours. The descriptive presentation of the survey results is relatively spare since there are no earlier data that provide a base for comparison. In future updates of these data, however, the sponsors will have an opportunity to analyze further how credit hour production shifts over time among the various types of institutions, as well as within and among each of the science, engineering, engineering technology, and humanities fields surveyed.

Detailed Statistical Tables

Note: In the following tables, detail may not sum to totals because of rounding.

Table 1

Undergraduate Student Credit Hours,
by Level of Instruction and Field of Study,
Fall 1980

All Institutions

Field of Study	Total		Lower Division		Upper Division	
	Number (000's)	Percent	Number (000's)	Percent	Number (000's)	Percent
All Fields	69,931	100.0	56,481	100.0	13,450	100.0
Subtotal for science, engineering, and engineering technology fields	48,967	70.0	38,226	67.7	10,741	79.9
Chemistry	3,503	5.0	2,957	5.2	547	4.1
Computer science	2,670	3.8	2,204	3.9	456	3.5
Earth sciences	1,567	2.2	1,280	2.3	287	2.1
Engineering	3,361	4.8	1,233	2.2	2,128	15.8
Engineering technology	1,615	2.3	1,366	2.4	249	1.8
Life sciences	6,745	9.6	5,109	9.0	1,637	12.2
Mathematical sciences	9,834	14.1	8,959	15.9	876	6.5
Physics/astronomy	2,656	3.8	2,322	4.1	334	2.5
Psychology	5,835	8.3	4,432	7.8	1,403	10.4
Social sciences (basic)	11,179	16.0	8,364	14.8	2,815	20.9
Subtotal for four humanities fields	20,965	30.0	18,256	32.3	2,709	20.1
English and American literature	11,267	16.1	10,166	18.0	1,101	8.2
History	4,538	6.5	3,738	6.6	800	5.9
Modern languages	3,289	4.7	2,822	5.0	467	3.5
Philosophy	1,871	2.7	1,529	2.7	341	2.5

Table 2

Undergraduate Student Credit Hours,
by Level of Instruction and Field of Study,
Fall 1980

All Public Institutions

Field of Study	Total		Lower Division		Upper Division	
	Number (000's)	Percent	Number (000's)	Percent	Number (000's)	Percent
All Fields	52,723	100.0	43,451	100.0	9,272	100.0
Subtotal for science, engineering, and engineering technology fields	37,431	71.0	29,838	68.7	7,593	81.9
Chemistry	2,640	5.0	2,262	5.2	378	4.1
Computer science	2,205	4.2	1,838	4.2	367	4.0
Earth sciences	1,299	2.5	1,058	2.4	241	2.6
Engineering	2,376	4.5	968	2.2	1,408	15.2
Engineering technology	1,516	2.9	1,326	3.1	190	2.1
Life sciences	5,288	10.0	4,050	9.3	1,238	13.4
Mathematical sciences	7,619	14.5	7,030	16.2	589	6.4
Physics/astronomy	1,881	3.6	1,685	3.9	195	2.1
Psychology	4,303	8.2	3,338	7.7	964	10.4
Social sciences (basic)	8,304	15.8	6,284	14.5	2,020	21.8
Subtotal for four humanities fields	15,292	29.0	13,613	31.3	1,679	18.1
English and American literature	8,684	16.5	7,956	18.3	728	7.9
History	3,325	6.3	2,809	6.5	517	5.6
Modern languages	2,182	4.1	1,904	4.4	278	3.0
Philosophy	1,100	2.1	944	2.2	156	1.7

Table 3

Undergraduate Student Credit Hours,
by Level of Instruction and Field of Study,
Fall 1980

All Private Institutions

Field of Study	Total		Lower Division		Upper Division	
	Number (000's)	Percent	Number (000's)	Percent	Number (000's)	Percent
All Fields	17,208	100.0	13,030	100.0	4,178	100.0
Subtotal for science, engineering, and engineering technology fields	11,535	67.0	8,387	64.4	3,148	75.4
Chemistry	863	5.0	695	5.3	168	4.0
Computer science	465	2.7	366	2.8	99	2.4
Earth sciences	268	1.6	223	1.7	45	1.1
Engineering	985	5.7	265	2.0	720	17.2
Engineering technology	99	0.6	41	0.3	58	1.4
Life sciences	1,457	8.5	1,058	8.1	398	9.5
Mathematical sciences	2,215	12.9	1,929	14.8	287	6.9
Physics/astronomy	775	4.5	636	4.9	139	3.3
Psychology	1,532	8.9	1,094	8.4	439	10.5
Social sciences (basic)	2,875	16.7	2,080	16.0	795	19.0
Subtotal for four humanities fields	5,673	33.0	4,643	35.6	1,030	24.6
English and American literature	2,583	15.0	2,210	17.0	373	8.9
History	1,212	7.0	929	7.1	283	6.8
Modern languages	1,107	6.4	919	7.1	188	4.5
Philosophy	770	4.5	585	4.5	185	4.4

Table 4

Undergraduate Student Credit Hours,
by Level of Instruction and Field of Study,
Fall 1980

All Universities

Field of Study	Total		Lower Division		Upper Division	
	Number (000's)	Percent	Number (000's)	Percent	Number (000's)	Percent
All Fields	22,694	100.0	15,785	100.0	6,909	100.0
Subtotal for science, engineering, and engineering technology fields	16,970	74.8	11,187	70.9	5,782	83.7
Chemistry	1,315	5.8	1,048	6.6	267	3.9
Computer science	607	2.7	377	2.4	230	3.3
Earth sciences	537	2.4	391	2.5	146	2.1
Engineering	2,327	10.3	652	4.1	1,675	24.2
Engineering technology	212	0.9	110	0.7	102	1.5
Life sciences	2,098	9.2	1,202	7.6	896	13.0
Mathematical sciences	3,112	13.7	2,667	16.9	445	6.4
Physics/astronomy	1,159	5.1	1,007	6.4	152	2.2
Psychology	1,492	6.6	1,011	6.4	481	7.0
Social sciences (basic)	4,112	18.1	2,724	17.3	1,388	20.1
Subtotal for four humanities fields	5,725	25.2	4,598	29.1	1,127	16.3
English and American literature	2,675	11.8	2,237	14.2	439	6.4
History	1,156	5.1	797	5.0	359	5.2
Modern languages	1,362	6.0	1,144	7.2	218	3.2
Philosophy	531	2.3	421	2.7	111	1.6

Table 5

Undergraduate Student Credit Hours,
by Level of Instruction and Field of Study,
Fall 1980

Top 50 Universities[1]

Field of Study	Total		Lower Division		Upper Division	
	Number (000's)	Percent	Number (000's)	Percent	Number (000's)	Percent
All Fields	9,530	100.0	6,095	100.0	3,436	100.0
Subtotal for science, engineering, and engineering technology fields	7,302	76.6	4,470	73.3	2,831	82.4
Chemistry	565	5.9	442	7.3	122	3.6
Computer science	276	2.9	145	2.4	131	3.8
Earth sciences	248	2.6	174	2.9	73	2.1
Engineering	922	9.7	252	4.1	670	19.5
Engineering technology	123	1.3	51	0.8	72	2.1
Life sciences	1,015	10.6	558	9.2	457	13.3
Mathematical sciences	1,279	13.4	1,040	17.1	239	7.0
Physics/astronomy	481	5.1	404	6.6	77	2.2
Psychology	635	6.7	364	6.0	271	7.9
Social sciences (basic)	1,758	18.4	1,040	17.1	719	20.9
Subtotal for four humanities fields	2,229	23.4	1,625	26.7	604	17.6
English and American literature	1,016	10.7	753	12.4	263	7.6
History	457	4.8	291	4.8	166	4.8
Modern languages	544	5.7	419	6.9	125	3.6
Philosophy	211	2.2	161	2.6	50	1.5

1. The 50 universities that awarded the largest number of bachelor's degrees in 1977-78.

Table 6

Undergraduate Student Credit Hours,
by Level of Instruction and Field of Study,
Fall 1980

Public Universities

Field of Study	Total		Lower Division		Upper Division	
	Number (000's)	Percent	Number (000's)	Percent	Number (000's)	Percent
All Fields	16,065	100.0	10,964	100.0	5,101	100.0
Subtotal for science, engineering, and engineering technology fields	12,249	76.2	8,002	73.0	4,246	83.2
Chemistry	1,002	6.2	803	7.3	199	3.9
Computer science	467	2.9	288	2.6	179	3.5
Earth sciences	464	2.9	335	3.1	129	2.5
Engineering	1,527	9.5	468	4.3	1,059	20.8
Engineering technology	184	1.1	101	0.9	83	1.6
Life sciences	1,724	10.7	975	8.9	748	14.7
Mathematical sciences	2,208	13.7	1,873	17.1	335	6.6
Physics/astronomy	751	4.7	643	5.9	109	2.1
Psychology	1,079	6.7	697	6.4	382	7.5
Social sciences (basic)	2,844	17.7	1,820	16.6	1,024	20.1
Subtotal for four humanities fields	3,817	23.8	2,962	27.0	855	16.8
English and American literature	1,766	11.0	1,415	12.9	352	6.9
History	825	5.1	565	5.2	260	5.1
Modern languages	874	5.4	706	6.4	168	3.3
Philosophy	352	2.2	276	2.5	76	1.5

Table 7

Undergraduate Student Credit Hours,
by Level of Instruction and Field of Study,
Fall 1980

Private Universities

Field of Study	Total		Lower Division		Upper Division	
	Number (000's)	Percent	Number (000's)	Percent	Number (000's)	Percent
All Fields	6,629	100.0	4,821	100.0	1,808	100.0
Subtotal for science, engineering, and engineering technology fields	4,721	71.2	3,185	66.1	1,536	85.0
Chemistry	313	4.7	245	5.1	68	3.7
Computer science	140	2.1	89	1.8	51	2.8
Earth sciences	73	1.1	56	1.2	18	1.0
Engineering	800	12.1	184	3.8	616	34.1
Engineering technology	29	0.4	9	0.2	19	1.1
Life sciences	375	5.6	226	4.7	148	8.2
Mathematical sciences	904	13.6	794	16.5	110	6.1
Physics/astronomy	407	6.1	364	7.6	43	2.4
Psychology	413	6.2	314	6.5	99	5.5
Social sciences (basic)	1,268	19.1	904	18.8	364	20.1
Subtotal for four humanities fields	1,908	28.8	1,636	33.9	272	15.0
English and American literature	909	13.7	822	17.1	87	4.8
History	331	5.0	231	4.8	100	5.5
Modern languages	489	7.4	439	9.1	50	2.8
Philosophy	179	2.7	144	3.0	35	1.9

Table 8

Undergraduate Student Credit Hours,
by Level of Instruction and Field of Study,
Fall 1980

All Four-year Colleges

Field of Study	Total		Lower Division		Upper Division	
	Number (000's)	Percent	Number (000's)	Percent	Number (000's)	Percent
All Fields	25,383	100.0	18,842	100.0	6,541	100.0
Subtotal for science, engineering, and engineering technology fields	17,498	68.9	12,539	66.5	4,959	75.8
Chemistry	1,313	5.2	1,033	5.5	280	4.3
Computer science	898	3.5	662	3.5	236	3.6
Earth sciences	678	2.7	537	2.9	141	2.2
Engineering	732	2.9	279	1.5	453	6.9
Engineering technology	308	1.2	161	.9	147	2.2
Life sciences	2,540	10.0	1,800	9.6	740	11.3
Mathematical sciences	3,225	12.7	2,795	14.8	430	6.6
Physics/astronomy	902	3.6	720	3.8	182	2.8
Psychology	2,446	9.6	1,523	8.1	922	14.1
Social sciences (basic)	4,456	17.6	3,029	16.1	1,427	21.8
Subtotal for four humanities fields	7,886	31.1	6,304	33.5	1,582	24.2
English and American literature	3,699	14.6	3,036	16.1	662	10.1
History	1,978	7.8	1,537	8.2	441	6.7
Modern languages	1,265	5.0	1,016	5.4	249	3.8
Philosophy	945	3.7	714	3.8	230	3.5

Table 9

Undergraduate Student Credit Hours,
by Level of Instruction and Field of Study,
Fall 1980

Public Four-year Colleges

Field of Study	Total		Lower Division		Upper Division	
	Number (000's)	Percent	Number (000's)	Percent	Number (000's)	Percent
All Fields	15,817	100.0	11,646	100.0	4,171	100.0
Subtotal for science, engineering, and engineering technology fields	11,365	71.9	8,018	68.8	3,347	80.2
Chemistry	811	5.1	632	5.4	179	4.3
Computer science	595	3.8	406	3.5	189	4.5
Earth sciences	515	3.3	402	3.5	113	2.7
Engineering	548	3.5	199	1.7	349	8.4
Engineering technology	238	1.5	130	1.1	108	2.6
Life sciences	1,613	10.2	1,123	9.6	490	11.7
Mathematical sciences	2,051	13.0	1,797	15.4	254	6.1
Physics/astronomy	559	3.5	473	4.1	86	2.1
Psychology	1,460	9.2	877	7.5	583	14.0
Social sciences (basic)	2,976	18.8	1,979	17.0	996	23.9
Subtotal for four humanities fields	4,452	28.1	3,628	31.2	824	19.8
English and American literature	2,179	13.8	1,803	15.5	377	9.0
History	1,180	7.5	923	7.9	257	6.2
Modern languages	672	4.2	562	4.8	110	2.6
Philosophy	421	2.7	341	2.9	80	1.9

Table 10

Undergraduate Student Credit Hours,
by Level of Instruction and Field of Study,
Fall 1980

Private Four-year Colleges

Field of Study	Total		Lower Division		Upper Division	
	Number (000's)	Percent	Number (000's)	Percent	Number (000's)	Percent
All Fields	9,566	100.0	7,196	100.0	2,370	100.0
Subtotal for science, engineering, and engineering technology fields	6,132	64.1	4,520	62.8	1,612	68.0
Chemistry	502	5.2	401	5.6	101	4.3
Computer science	303	3.2	256	3.6	47	2.0
Earth sciences	162	1.7	134	1.9	28	1.2
Engineering	184	1.9	80	1.1	104	4.4
Engineering technology	70	0.7	32	0.4	39	1.6
Life sciences	927	9.7	676	9.4	250	10.5
Mathematical sciences	1,174	12.3	998	13.9	177	7.5
Physics/astronomy	343	3.6	247	3.4	96	4.1
Psychology	986	10.3	647	9.0	339	14.3
Social sciences (basic)	1,481	15.5	1,050	14.6	431	18.2
Subtotal for four humanities fields	3,434	35.9	2,676	37.2	758	32.0
English and American literature	1,519	15.9	1,234	17.1	286	12.1
History	798	8.3	614	8.5	184	7.8
Modern languages	593	6.2	455	6.3	139	5.9
Philosophy	524	5.5	374	5.2	150	6.3

Table 11

Lower Division Student Credit Hours at Two-year Colleges,
by Field of Study and Control of Institution,
Fall 1980

Field of Study	Total		Public		Private	
	Number (000's)	Percent	Number (000's)	Percent	Number (000's)	Percent
All Fields	21,854	100.0	20,841	100.0	1,013	100.0
Subtotal for science, engineering, and engineering technology fields	14,500	66.3	13,818	66.3	682	67.3
Chemistry	876	4.0	827	4.0	48	4.7
Computer science	1,166	5.3	1,144	5.5	22	2.2
Earth Sciences	353	1.6	320	1.5	32	3.2
Engineering	302	1.4	301	1.4	1	0.1
Engineering technology	1,095	5.0	1,095	5.3	0	0.0
Life sciences	2,107	9.6	1,952	9.4	156	15.4
Mathematical sciences	3,497	16.0	3,360	16.1	137	13.5
Physics/astronomy	595	2.7	570	2.7	25	2.5
Psychology	1,898	8.7	1,764	8.5	133	13.1
Social sciences (basic)	2,611	11.9	2,485	11.9	127	12.5
Subtotal for four humanities fields	7,354	33.7	7,023	33.7	331	32.7
English and American literature	4,893	22.4	4,739	22.7	154	15.2
History	1,404	6.4	1,321	6.3	84	8.3
Modern languages	662	3.0	636	3.1	25	2.5
Philosophy	395	1.8	327	1.6	67	6.6

Note: Two-year colleges were instructed to report all student credit hours in the lower division.

Appendix A

Survey Instrument

AMERICAN COUNCIL ON EDUCATION
ONE DUPONT CIRCLE
WASHINGTON, D. C. 20036

HIGHER EDUCATION PANEL

June 19, 1981

Dear Higher Education Panel Representative:

Attached is the 54th Higher Education Panel survey, sponsored jointly by the National Science Foundation and the National Endowment for the Humanities. Entitled "Undergraduate Instruction in Science, Engineering, and the Humanities," its purpose is to assess the amount and level of undergraduate teaching in these fields. The findings will assist both NSF and NEH in planning programs and establishing priorities affecting instruction in the sciences and the humanities.

As a result of an earlier field test, we learned that most institutions will be able to provide the requested student credit hour information from a central source, usually the office of institutional research. However, as usual, we leave that decision to you.

Please understand that responses from your institution will be held in strict confidence. As with all our surveys, the data you provide will be reported in summary fashion only and will not be identifiable with your institution. This survey is authorized by the National Science Foundation Act of 1950, as amended. Although you are not required to respond, your cooperation is needed to make the results comprehensive, reliable, and timely.

Please forward the completed questionnaire to us by July 10,1981. If you have any problems or questions, please do not hesitate to telephone us collect at 202-833-4757.

Thank you for your cooperation and assistance.

Sincerely,

Frank J. Atelsek

Frank J. Atelsek
Panel Director

FIELDS OF SCIENCE AND ENGINEERING

Please report on undergraduate instruction in the fields listed below. The listing of subfields is illustrative rather than exhaustive. Your institution may have a different classification of subfields within a major discipline. If instruction in a department, college, or division is offered in more than one major discipline (e.g., engineering, life sciences), information should be reported separately for each major discipline. In particular, computer science instruction should be reported separately, whether it is in the department of mathematics, college of engineering, or other organizational unit.

CHEMISTRY
- Analytical
- Environmental sciences (chemistry)
- General chemistry
- Organic
- Physical
- Chemistry, other

COMPUTER SCIENCE
- Theoretical computer science
- Software systems science
- Software engineering
- Intelligent systems
- Computer systems design
- Computer science, other

EARTH SCIENCES
- Environmental sciences (earth sciences)
- Geochemistry
- Geography (physical)
- Geology
- Geophysics
- Earth sciences, other

ENGINEERING
- Aeronautical
- Bioengineering
- Chemical
- Civil
- Electrical
- Engineering science
- Environmental sciences (engineering)
- Industrial
- Materials
- Mechanical
- Metallurgical
- Nuclear
- Petroleum
- Sanitary
- Engineering, other

ENGINEERING TECHNOLOGY

LIFE SCIENCES
- Agriculture (except agricultural economics)
- Anatomy
- Biochemistry
- Botany (including plant physiology)
- Cellular biology
- Ecology
- Entomology
- Environmental sciences (life)
- General biology
- Genetics
- Horticulture
- Microbiology
- Molecular biology
- Physiology
- Soil science
- Zoology
- Life sciences, other

MATHEMATICAL SCIENCES
- Algebra or number theory
- Applications of mathematics (including biometrics and biostatistics)
- Calculus
- Geometry
- Introductory college mathematics
- Logic or foundation of mathematics
- Probability and statistics
- Mathematics, other

PHYSICS/ASTRONOMY
- Acoustics
- Atomic and molecular
- Environmental sciences (physics)
- General physics
- Nuclear
- Optics
- Solid state
- Theoretical physics
- Physics, other
- Astronomy
- Atmospheric sciences (excluding meteorology)
- Metallurgy (excluding met. engineering)
- Meteorology

PSYCHOLOGY (excluding clinical)
- Developmental
- Environmental sciences (behavioral)
- Experimental, comparative or physiological
- General psychology
- Psychometrics
- Social
- Psychology, other

SOCIAL SCIENCES (BASIC)
- Agricultural economics
- Anthropology
- Archaeology
- Economics (excluding business administration)
- Environmental sciences (social)
- Geography (other than physical)
- History and philosophy of science
- Linguistics
- Political science
- Sociology (not including social work)
- Social sciences, other

HUMANITIES FIELDS

Please report on undergraduate instruction in only the fields listed below.

ENGLISH AND AMERICAN LITERATURE
- include comparative literature, writing, or other courses within the English department

HISTORY

MODERN LANGUAGES
- Romance (Italian, French, Portuguese, Spanish), Germanic and Slavic only.

PHILOSOPHY
- exclude religion

OMB No. 099-R0265
exp. 6/81

American Council on Education
Higher Education Panel Survey Number 54:

UNDERGRADUATE INSTRUCTION IN SCIENCE, ENGINEERING, AND THE HUMANITIES,
FALL TERM 1980

Two-year colleges should normally report all student credit hours as lower division.

Do not complete this questionnaire if your institution has a four-year undergraduate program *but does not distinguish between upper and lower division courses.*
Please check here and return this form to us. ( )

Before completing this questionnaire, please read carefully all instructions and definitions.

All Undergraduate Courses in:	Number of Student Credit Hours[a] in: Lower Division[b] Undergraduate Courses	Upper Division[c] Undergraduate Courses
SCIENCE AND ENGINEERING		
CHEMISTRY		
COMPUTER SCIENCE		
EARTH SCIENCES		
ENGINEERING		
ENGINEERING TECHNOLOGY		
LIFE SCIENCES		
MATHEMATICAL SCIENCES		
PHYSICS/ASTRONOMY		
PSYCHOLOGY		
SOCIAL SCIENCES (BASIC)		
HUMANITIES		
ENGLISH AND AMERICAN LITERATURE		
HISTORY		
MODERN LANGUAGES		
PHILOSOPHY		

What is the academic calendar of your institution? ( )semester ( )quarter ( )other (specify)_____

Definitions:

Student credit hours- the credit value of a course multiplied by the number of students registered for that course

Lower division courses- courses ordinarily open to undergraduates in the first two years of a four-year curriculum: two-year colleges should report all data here

Upper division courses- courses ordinarily open to undergraduates during the third and fourth years of a four-year curriculum

Thank you for your assistance. Please return this form by July 10, 1981 to:

Higher Education Panel
American Council on Education
One Dupont Circle, N.W. (#829)
Washington, D.C. 20036

Please keep a copy of this survey for your records.

Person completing form

Name_____

Dept._____

Phone_____

If you have any questions or problems, please call the HEP staff collect at (202)833-4757.

(See opposite page for fields)

Appendix B

Technical Notes

Weighting

Data from the responding panel institutions were statistically adjusted to represent the national population of institutions that enroll undergraduate students. Excluded were independent medical schools and certain other institutions that provide only post-baccalaureate instruction. These exclusions resulted in a total of 698 panel institutions with undergraduate courses. Responses were received from 563 institutions, of which 65 indicated that they made no distinction between lower and upper division courses. Such institutions were treated as nonrespondents in the weighting procedures. The following table shows the weighting design, including the estimated population, the total number of respondents, and the number of respondents that made a distinction between lower and upper division courses.

Table B-1

Stratification Design

Cell	Type of Institution	Population	Respondents	
			Total	With Upper & Lower Div. Courses
	Total	2,732	563	498
01	Public universities	111	102	99
02	Private universities	72	59	37
04	Public black four-year colleges FTE > 3,000	13	7	7
05	Public nonblack four-year colleges FTE > 8,750	106	83	79
07	Private nonblack four-year colleges FTE > 8,750	12	6	5
08	Public two-year colleges FTE > 8,750	35	21	21
09	Public four-year colleges FTE 3,700-8,750	77	36	35
10	Public four-year colleges FTE < 3,700	178	29	26
11	Private four-year colleges FTE 2,000-8,750	131	34	26
12	Private four-year colleges FTE 1,000-2,0000	276	39	25
13	Private four-year colleges FTE < 1,000	660	24	16
14	Public two-year colleges FTE 5,100-8,750	62	26	25
15	Public two-year colleges FTE 3,260-5.100	102	28	28
16	Public two-year colleges FTE 1,600-3,260	173	29	29
17	Public two-year colleges FTE < 1,600	498	30	30
18	Private two-year colleges	226	10	10

The weighting technique used was the standard one employed for full Panel surveys. Data received from Panel members were adjusted for item and institutional nonresponse within each cell. Then insitutional weights were applied to bring the Panel data up to estimates representative of the national population.

Comparison of Respondents and Nonrespondents

Table B-2 compares survey respondents and nonrespondents against several variables. Higher-than-average response rates were recorded for both public and private universities, public four-year colleges, institutions in the Midwest and South, and those with undergraduate full-time-equivalent (FTE) enrollments above 7,400 students. Two-year colleges, private four-year colleges, institutions with FTE enrollments of 7,400 or less, and those in the West had lower-than-average response rates.

Table B-2

Comparison of Respondents and Nonrespondents
(In percentages)

Characteristic	Respondents (N=563)	Nonrespondents (N=135)	Response Rate
Total	100.0	100.0	80.7
Control			
Public	69.4	67.4	81.1
Private	30.6	32.6	79.6
Type and control			
Public universities	18.1	5.2	93.6
Private universities	10.5	7.4	85.5
Public four-year colleges	27.5	18.5	86.1
Private four-year colleges	18.3	19.3	79.8
Public two-year colleges	23.8	43.7	69.4
Private two-year colleges	1.8	5.9	55.6
Region			
East	24.9	24.4	80.9
Midwest	30.2	26.7	82.5
South	25.9	20.0	84.4
West	19.0	28.9	73.3
Total undergraduate full-time-equivalent enrollment (1976)			
Less than 500	5.5	10.4	68.9
500 - 7,400	63.4	74.1	78.1
7,401 - 17,000	25.4	14.1	88.3
17,001 or more	5.7	1.5	94.1

Note: All percentages were calculated from total responses, including those from institutions that were unable to distinguish between upper and lower division courses.

Reliability of Survey Estimates

Since the statistics presented in this report are based on a sample, they will differ somewhat from the figures which would have been obtained if a

complete census had been taken using the same survey instrument, instructions, and procedures. As in any survey, the results are also subject to reporting and processing errors and errors due to nonresponse. To the extent possible, these types of errors were kept to a minimum by methods built into the survey procedures.

The standard error is primarily a measure of sampling variability--that is, the variations that might occur by chance because only a sample of the institutions is surveyed. The chances are about 68 out of 100 that an estimate from the sample would differ from a complete census by less than the standard error. The chances are about 90 out of 100 that it would be less than 1.65 times the standard error; about 95 out of 100 that it would be less than 1.96 times the standard error; and about 99 out of 100 that it would be less than 2.5 times as large. Thus, knowing the standard error permits us to specify a range within which we can have a stated confidence that a given estimate would lie if a complete census, rather than a sample survey, had been conducted. As an example, refer in table B-3 to the estimated number of credit hours in lower division chemistry taken at all institutions--2,957,000. The 90 percent confidence interval for that item is plus or minus 120,000. Thus, chances are about 90 out of 100 that a complete census would show the number of credit hours would be more than 2,837,000 and less than 3,077,000.

Table B-3 shows 90 percent confidence intervals of selected survey items for all institutions and for several institutional types separately.

Table B-3

Ninety Percent Confidence Intervals for Selected Survey Estimates, by Type of Institution
(In thousands of student credit hours)

Discipline/Division	Credit Hours Estimate	Credit Hours Confidence Intervals±	Credit Hours Estimate	Credit Hours Confidence Intervals±	Credit Hours Estimate	Credit Hours Confidence Intervals±
	All Institutions		Universities		All 4-year Colleges	
Chemistry, lower division	2,957	120	1,048	54	1,033	69
Computer science, upper division	466	30	230	14	236	27
Engineering, upper division	2,128	396	1,675	392	453	61
English, lower division	10,166	1,656	2,237	572	3,036	197
History, upper division	800	46	359	25	441	39
Physics, lower division	2,322	198	1,007	161	720	90
Social sciences, lower division	8,364	546	2,724	417	3,029	205
	Large 4-year Colleges		Small 4-year Colleges		All 2-year Colleges	
Chemistry, lower division	374	19	657	66	876	84
Computer science, upper division	119	13	116	24	na	na
Engineering, upper division	275	28	169	56	na	na
English, lower division	975	40	2,054	193	4,893	1,549
History, upper division	144	10	296	38	na	na
Physics, lower division	288	18	432	89	595	81
Social sciences, lower division	1,208	54	1,817	198	2,611	298

na: Not applicable

Other Reports of the Higher Education Panel
American Council on Education

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